

INTESTINAL HUMAN NEMATODES

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➤ Intestinal human nematodes:

- ✓ *Ancylostoma duodenale*.
- ✓ *Necator Americanus*.
- ✓ *Strongyloides stercoralis*.
- ✓ *Ascaris lumbricoides*.
- ✓ *Enterobius vermicularis*.
- ✓ *Trichuris trichiura*.

INTESTINAL HUMAN NEMATODES

- Adult nematodes living in the human gut can cause disease.
- There are **two types**:
 - The hookworms, which have a soil stage in which they develop into larvae that then penetrate the host.
 - A group of nematodes that survive in the soil merely as eggs, which have to be ingested for their life cycle to continue.

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- The geographical distribution of hookworms is limited by the larval requirement for warmth and humidity.
- Soil-transmitted nematode infections can be prevented by:-
 - Avoidance of fecal soil contamination (adequate sewerage disposal) or skin contact (wearing shoes).
 - Strict personal hygiene.

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Ancylostomiasis

- Ancylostomiasis is caused by *Ancylostoma duodenale* or *Necator americanus*.
- The complex life cycle is shown in Figure.
- Adult hookworm is 1 cm long and lives in the duodenum and upper jejunum.
- Eggs are passed in the faeces.
- In warm, moist, shady soil, the larvae develop into rhabditiform and then the infective filariform stages; they then penetrate human skin and are carried to the lungs.

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Ancylostomiasis

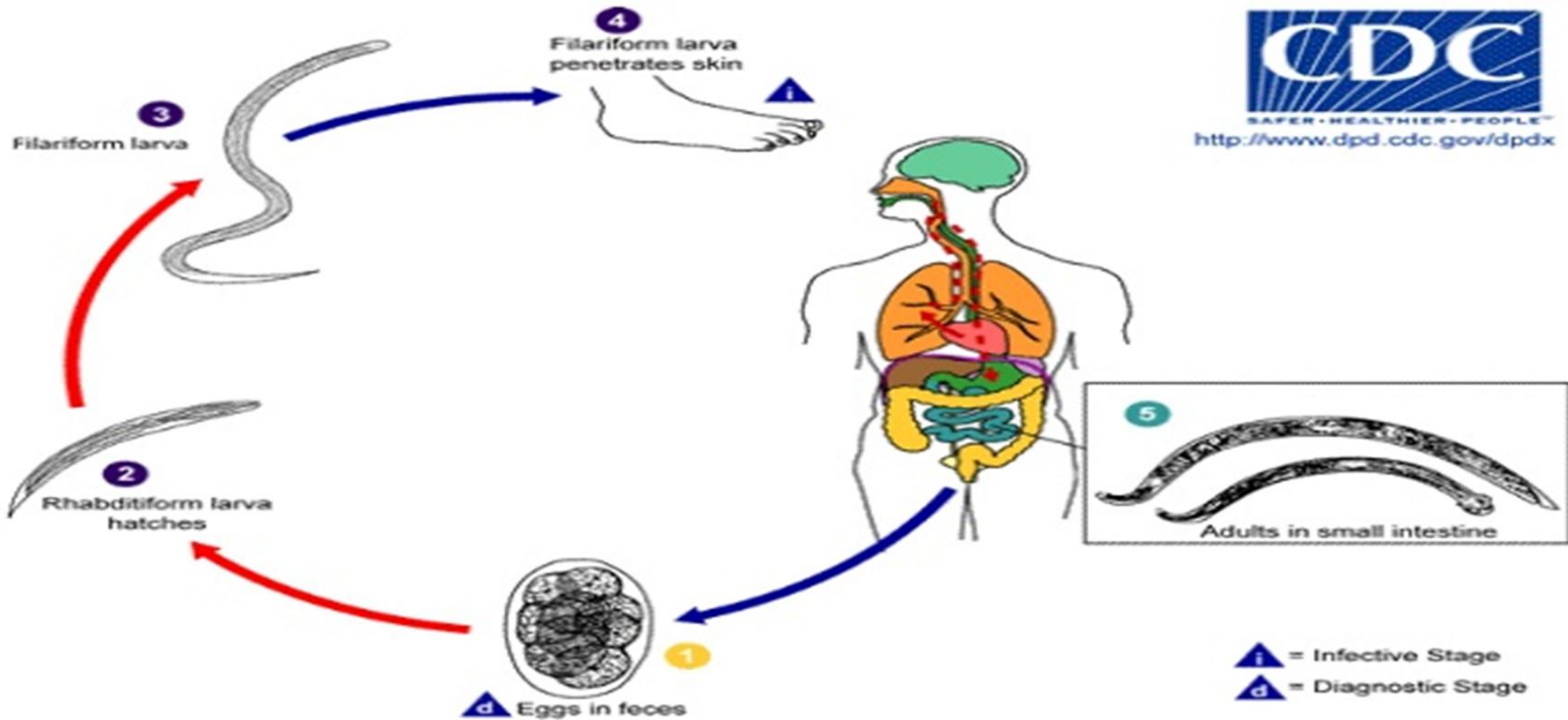
- After entering the alveoli, they ascend the bronchi, are swallowed and mature in the small intestine, reaching maturity 4–7 weeks after infection.
- The worms attach to the mucosa of the small intestine by their buccal capsule and withdraw blood.
- The mean daily blood loss from one *A. duodenale* is 0.15 mL and that from *N. americanus* 0.03 mL.
- Hookworm infection is a leading cause of anemia in the tropics and subtropics.

Life cycle



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Ancylostomiasis

❖ *Clinical features :-*

- Allergic dermatitis, usually on the feet, may be at the time of infection.
- The lungs infection (larva) causes a paroxysmal cough with blood-stained sputum, associated with patchy pulmonary consolidation and eosinophilia.
- The small intestine (worm) symptoms includes; vomiting and epigastric pain resembling peptic ulcer disease may occur, and frequent loose stools are passed.
- The degree of iron and protein deficiency depends not only on the worm burden but also on patient nutrition and iron stores.
- Anemia with high-output cardiac failure may result.
- The mental and physical development of children may be delayed in severe infection.

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Ancylostomiasis

❖ Investigations :-

- Eosinophilia.
- The characteristic ovum can be recognized in the stool.
- Positive fecal occult blood testing, if hookworms are present in numbers sufficient to cause anemia.

❖ Management :-

- A single dose of albendazole is the treatment of choice.
- Alternatively, mebendazole twice daily for 3 days may be used.
- Anemia and heart failure associated with hookworm infection respond well to oral iron.
- Blood transfusion is rarely required.

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Strongyloidiasis (threadworm)

- **Strongyloides stercoralis** is a small nematode (2 mm × 0.4 mm).
- Parasitises the mucosa of the upper part of the small intestine, often in large numbers.
- Causing persistent eosinophilia.
- The eggs hatch in the bowel but only larvae are passed in the faeces.
- Become the infective filariform larvae in moist soil, they moult.

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Strongyloidiasis (threadworm)

- After penetrating human skin, they undergo a development cycle similar to that of hookworms, except that the female worms burrow into the intestinal mucosa and submucosa.
- Some larvae in the intestine may develop into filariform larvae, which may then penetrate the mucosa or the perianal skin and lead to autoinfection and persistent infection.
- Patients with Strongyloides infection persisting for more than 35 years have been described.
- Occurs in the tropics and subtropics, and is especially prevalent in the Far East.

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Strongyloidiasis (threadworm)

❖ Clinical features :-

- The classic triad of symptoms consists of abdominal pain, diarrhea and urticaria.
- **Cutaneous manifestations**, either urticaria or larva currens.
 - ✓ A highly characteristic pruritic, elevated, erythematous lesion, rapidly advancing along the course of larval migration.
- ✓ Occur in 66% of patients.
- **Systemic strongyloidiasis** (the *Strongyloides* hyper infection syndrome).
 - ✓ Dissemination of larvae throughout the body.
- ✓ Occurs with immune suppression (HIV or HTLV-1 infection, immunosuppressant treatment).
- ✓ Mortality with this syndrome approaches 100% without treatment and has been about 25% with treatment.

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Strongyloidiasis (threadworm)

❖ Clinical features :-

- **Systemic strongyloidiasis** (the *Strongyloides* hyper infection syndrome).
- Hyper infection large numbers of larvae can migrate to many tissues, including the lungs, CNS, kidneys, and liver.
- Patients present with severe, generalized abdominal pain, abdominal distension and shock.
- Massive larval invasion of the lungs causes cough, wheeze and dyspnea.
- Cerebral involvement has manifestations ranging from subtle neurological signs to coma.
- Gram-negative sepsis frequently complicates the picture.

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Strongyloidiasis (threadworm)

❖ Investigations :-

- Eosinophilia.
- Serology (ELISA) is helpful.
- The definitive diagnosis depends on finding the larvae in the faeces.
- Excretion is intermittent and so repeated examinations are necessary.
- Larvae may be found in jejunal aspirates or detected using the string test.
- Larvae may also be cultured from faeces.

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Strongyloidiasis (threadworm)

❖ Screening :-

- A ware of the possibility of strongyloidiasis in persons with even a distant history of residence in an endemic area, since the infection can be latent for decades.
- Screening of at-risk individuals for infection before institution of immunosuppressive therapy.
- Screening can consist of serologic tests, with stool examinations in those with positive serologic tests.

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Strongyloidiasis (threadworm)

❖ **Management :-**

- Full eradication of *S stercoralis* is more important due to the ability of the parasite to replicate in humans.
- A course of two doses of ivermectin, administered on successive days, is effective.
- Alternatively, albendazole is given orally (twice daily for 3 days).
- A second course may be required.

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Strongyloidiasis (threadworm)

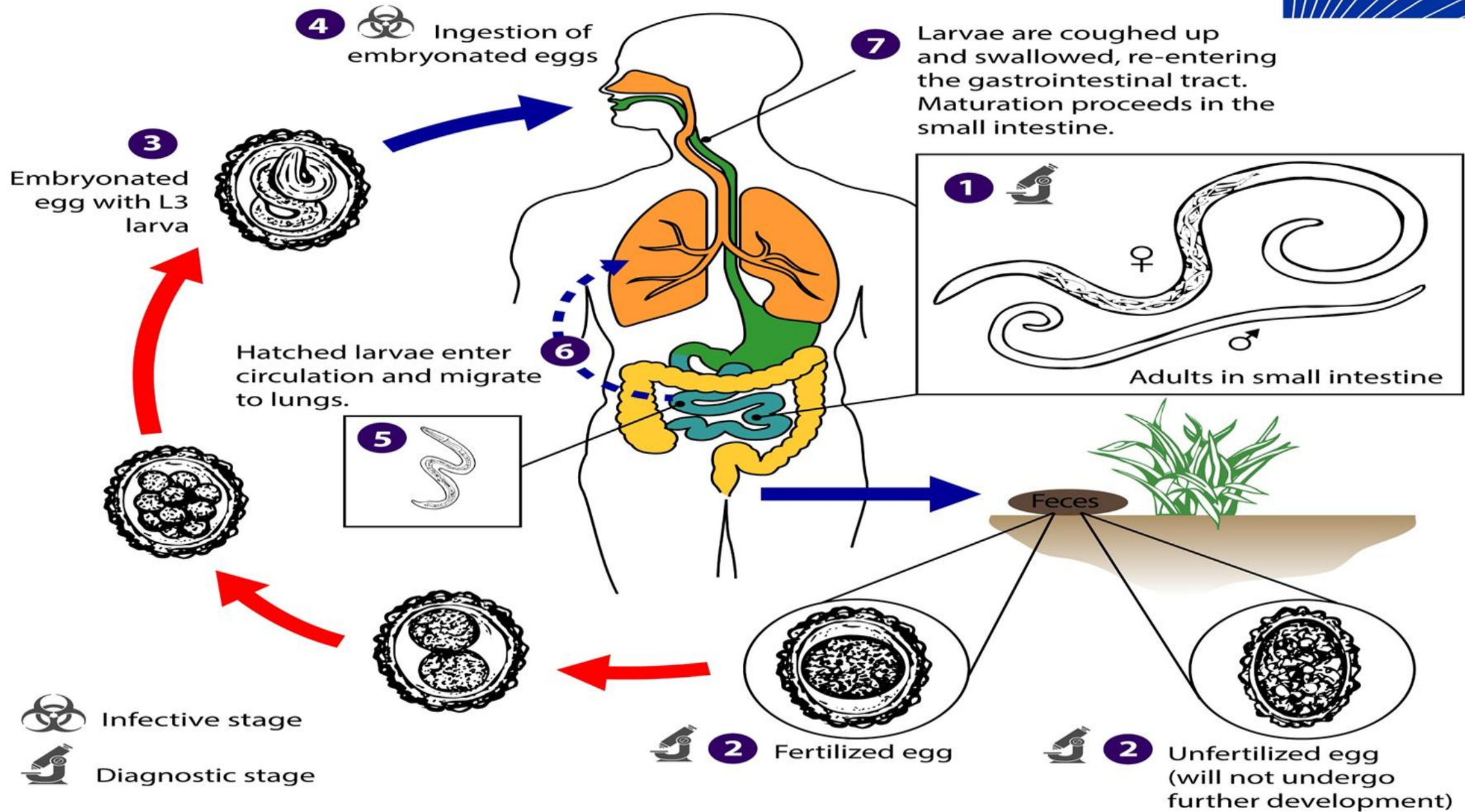
❖ *Management :-*

- In *Strongyloides* hyper infection syndrome, ivermectin should be administered daily until the clinical syndrome has resolved and larvae have not been identified for at least 2 weeks.
- Follow-up examinations for larvae in stool or sputum are necessary, with repeat dosing if the infection persists.
- In continued immunosuppression, eradication may be difficult, and regular repeated doses of antihelminthic therapy (eg, monthly ivermectin) may be required.

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Ascaris lumbricoides (roundworm)

- This pale yellow nematode is 20–35 cm long.
- Humans are infected by eating food contaminated with mature ova.
- *Ascaris* larvae hatch in the duodenum, migrate through the lungs, ascend the bronchial tree, are swallowed and mature in the small intestine.
- This tissue migration can provoke both local and general hypersensitivity reactions, with pneumonitis, eosinophilic granulomas, wheezing and urticaria.



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Ascaris lumbricoides (roundworm)

❖ *Clinical features :-*

- Most persons with *Ascaris* infection are asymptomatic.
- symptoms develop during migration of worms through the lungs, with ;-
 - Fever.
 - Nonproductive cough.
 - Chest pain.
 - Dyspnea.
 - Eosinophilia.
 - Occasionally with eosinophilic pneumonia.

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Ascaris lumbricoides (roundworm)

❖ *Clinical features :-*

- Intestinal ascariasis causes symptoms ranging from vague abdominal pain to malnutrition.
- In heavy infection, abdominal discomfort may be seen.
- Adult worms can be coughed up, be vomited, or may emerge through the nose or anus.
- Intestinal obstruction, due to large size of the adult worm and its tendency to aggregate.
- Causes up to 35% of all intestinal obstructions, most commonly in the terminal ileum .
- Obstruction can be complicated further by intussusception, volvulus, hemorrhagic infarction and perforation.
- Other complications include blockage of the bile or pancreatic duct and obstruction of the appendix by adult worms.

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Ascaris lumbricoides (roundworm)

❖ Investigations :-

- The diagnosis is made microscopically by finding ova in the faeces.
- Adult worms are frequently expelled rectally or orally.
- Occasionally, the worms are demonstrated radiographically by a barium examination.
- Eosinophilia.

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Ascaris lumbricoides (roundworm)

❖ Management:-

- A single dose of albendazole , pyrantel pamoate, or ivermectin.
- Alternatively mebendazole (twice daily for 3 days) treats intestinal ascariasis.
- Obstruction due to ascariasis should be treated with nasogastric suction, piperazine and intravenous fluids.
- Complete intestinal obstruction and its complications require urgent surgical intervention.

❖ Prevention:-

- Community chemotherapy programs reduce *Ascaris* infection.
- The whole community can be treated every 3 months for several years.
- Alternatively, school children are targeted; treating them lowers the prevalence of ascariasis.

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Enterobius vermicularis (threadworm)

- This helminth is common worldwide and affects mainly children.
- After the ova are swallowed, development takes place in the small intestine but the adult worms are found chiefly in the colon.
- The ova are often carried to the mouth on the fingers and so reinfection or human-to-human infection occurs.
- In females, the genitalia may be involved.
- The adult worms may be seen moving on the buttocks or in the stool.

INTESTINAL HUMAN NEMATODES

Enterobius vermicularis (threadworm)

❖ Clinical features :-

- In female lays ova around the anus, causing intense itching, especially at night.
- In females, the genitalia may be involved.
- Perianal scratching may result in excoriation and impetigo.

❖ Investigations :-

- Pinworm eggs are usually not found in stool.
- Diagnosis is made by finding adult worms or eggs on the perianal skin.
- A common test is to apply clear cellophane tape to the perianal skin, ideally in the early morning, followed by microscopic examination for eggs.
- A perianal swab, moistened with saline, also allows diagnosis.

INTESTINAL HUMAN NEMATODES

Enterobius vermicularis (threadworm)

❖ Management :-

- A single dose of mebendazole, albendazole, pyrantel pamoate or piperazine.
- Repeated after 2 weeks to control auto-reinfection.
- If infection recurs in a family, each member should be treated.
- All nightclothes and bed linen are laundered during treatment.
- Fingernails must be kept short and hands washed carefully before meals.
- Subsequent therapy is reserved for family members with recurrent infection

INTESTINAL HUMAN NEMATODES

Trichuris trichiura (whipworm)

- Whipworm infections are common worldwide with poor hygiene.
- Infection follows ingestion of earth or food contaminated with ova, which have become infective after lying for 3 weeks or more in moist soil.
- The adult worm is 3–5 cm long and has a coiled anterior end resembling a whip.
- Whipworms inhabit the caecum, lower ileum, appendix, colon and anal canal.
- Usually no symptoms.

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Trichuris trichiura (whipworm)

- Intense infections in children may cause;-
 - ✓ Persistent diarrhea.
 - ✓ Rectal prolapse.
 - ✓ Growth retardation.
- May develop the *Trichuris* dysentery syndrome.
 - ✓ Particularly in malnourished young children.
 - ✓ Finding resembling inflammatory bowel disease including;-
 - Bloody diarrhea.
 - Rectal prolapse.

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Trichuris trichiura (whipworm)

- The diagnosis is readily made by identifying ova in faeces.
- Treatment is with mebendazole in doses twice daily or albendazole daily for 3 days for patients with light infections, and for 5–7 days for those with heavy infections.

Thank you